

pale brown; tegulæ white; abdomen black; the underside and the legs grey. Primaries white, crossed near the base from the costal to the inner margin by a wide olive-green band, edged with black on the inner side; this band narrows in the middle; an elongated olive-green spot on the costal margin near the apex; the fringe green and white: secondaries white, shaded with brown at the apex and along the inner margin. Underside of both wings white, the costal margin of the primaries pale brown.

Expanse $1\frac{1}{2}$ inch.

Hab. S.E. Peru, Santo Domingo, 6000 feet; Oconeque, Carabaya, 7000 feet (*G. Ockenden, Mus. Druce*).

This species is allied to *Dicentria peruda*, Druce.

Meragisa rufipuncta, sp. n.

Male.—Head grey; palpi black, the third joint yellowish brown; antennæ black; collar black; tegulæ grey, tipped with black; thorax grey; abdomen blackish brown, the base clothed with yellow hairs; the anus grey; the underside of the thorax, abdomen, and legs yellow. Primaries silvery grey, crossed by fine waved black lines and irrorated with black scales; a large reddish-brown spot close to the base, one in the cell, two near the apex, and one at the anal angle; the fringe alternately black and grey: secondaries greyish black, the base and inner margin yellow; the fringe yellow and black. Underside: primaries blackish grey, the base and outer margin from the apex to the anal angle yellow: secondaries pale yellow, clouded with dark grey beyond the middle.

Expanse $2\frac{1}{4}$ inches.

Hab. S.E. Peru, Santo Domingo, 6000 feet (*G. Ockenden, Mus. Druce*).

LXI.—*The Generic Arrangement of the African Squirrels.*
By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

IN the Journal of the Bombay Natural History Society for last year * I ventured to give a list of the Asiatic Squirrels,

* xviii. p. 246.

sorted into their respective genera, in the modern restricted sense of the word, and the present paper is an attempt similarly to arrange the African species.

These latter are in a sense much more complicated and difficult than their Asiatic allies, as the groups are less obvious in general character, so that a careful study of the teeth of every species has had to be made and the animals sorted accordingly.

It proves unfortunately that a larger number of genera than is either pleasant or convenient demand recognition, if we are to uphold the sound principle enunciated by Forsyth Major that squirrels should be classified by their dental and cranial characters just as other rodents are, and do not rely on such superficial characters as the presence or absence of stripes, or similar external characters. I have tried to be as conservative as possible, but there seems no stopping-place between the present arrangement and the wholesale and inconvenient lumping of all the forms in a single genus. Such a lumping would conceal the natural relationships of the different species and ignore all the important structural characters now dealt with.

The basis of this work is the classical paper of 1893*, by Dr. Forsyth Major, adopted and modified by myself in 1897 †, but now become more or less obsolete, and needing bringing up to date by the examination of the skulls and teeth of all the species known.

The following is a synopsis of the genera which appear to be recognizable:—

- I. Size not minute, skull-length at least 30 mm. Skull normal; anterior zygoma-root slanted, its anterior face looking downwards and forwards. (Sciurinae.)
 - A. Fur soft, not spinous. Palate not or little produced behind molars. Postorbital processes well developed, directed outwards, near middle of combined orbito-temporal fossa.
 - a. Size small or medium; greatest skull-length less than 62 mm.
 - a². Lower molars basin-shaped as in *Sciurus*.
 - a³. Skull normal, forehead flat. Anteorbital foramen in front of level of premolars.
 - a⁴. Cheek-teeth $\frac{5}{4}$ † 1. *Sciurus*.

* P. Z. S. 1893, p. 179; classification on p. 189.

† P. Z. S. 1897, p. 933.

‡ *S. persicus*, with only $\frac{4}{4}$ cheek-teeth, but similar to true *Sciurus* in all other characters, should form a special subgenus, which might be called *Tenes*.

- b^4 . Cheek-teeth $\frac{4}{4}$ 2. *Heliosciurus*.
 b^3 . Skull high, forehead level. Anteorbital foramen above p^4 .
 Cheek-teeth $\frac{5}{4}$ 3. *Myrsilus*.
 b^2 . Lower molars more or less ridged transversely. Teeth $\frac{5}{4}$.
 c^3 . Lower molars regularly and deeply ridged, without high
 cusps. Muzzle very long 4. *Funisciurus*.
 d^3 . Lower molars irregularly ridged, with high cusps. Muzzle
 not specially elongated 5. *Paraxerus*.
 b . Size very large, skull-length exceeding 64 mm.; zygoma-root
 bowed over as in *Xerus*, its front edge surpassing the maxillo-
 premaxillary suture. Cheek-teeth $\frac{4}{4}$.
 c^2 . Skull normal. Muzzle short; bullæ large; anteorbital
 foramen rounded..... 6. *Protoxerus*.
 d^2 . Skull elongate. Muzzle long; bullæ small; anteorbital
 foramen slit-like..... 7. *Epixerus*.
 B. Fur spinous. Palate produced in middle line some way behind
 molars. Ridge of zygoma-root strongly bowed forwards. Post-
 orbital processes directed backwards, near the hinder end of the
 combined orbito-temporal fossæ.
 c . Brachyodont, or very slightly hypsodont. (Size smaller, skull-
 length below 53 mm.)
 e^2 . Cheek-teeth $\frac{5}{4}$. Skull flattened 8. *Atlantoxerus*.
 f^2 . Cheek-teeth $\frac{4}{4}$. Skull more arched 9. *Xerus*.
 d . Strongly hypsodont. (Length of skull above 55 mm.)
 g^2 . Cheek-teeth $\frac{4}{4}$. Skull arched, broad and heavy.
 10. *Geosciurus*.
 h^2 . Cheek-teeth $\frac{5}{4}$. Skull high, narrow 11. *Euxerus*.
 II. Size minute, skull-length about 25 mm. Skull highly abnormal;
 anterior zygomatic plate vertical; postorbital processes minute;
 orbits occupying practically the whole of the orbito-temporal fossæ.
 (Nannosciurinae.)
 e . Cheek-teeth $\frac{4}{4}$. Ectopterygoid suppressed.... 12. *Myosciurus*.

1. SCIURUS.

Type.

Linn. Syst. Nat. (10) i. p. 63 (1758)..... *S. vulgaris*.

Three African species, with distinctly basin-shaped lower molars and $\frac{5}{4}$ cheek-teeth, may be provisionally referred to *Sciurus*. They are not very uniform among themselves in their skull-shapes, nor is any one of them closely similar to *S. vulgaris*, but the many forms of *Sciurus* found in the East present so great a range of variation that no tangible or constant characters can be found to separate off these African species.

The three are *S. poensis*, Smith, *lucifer*, Thos., and *nucenzorii*, Schwann.

It is rather a surprise to find *S. poensis* is not a *Funisciurus*, but has *Sciurus*-like basin-shaped molars. *S. lucifer* is more doubtful, and may perhaps be a *Paraxerus*, but no specimens with unworn teeth are as yet available.

2. HELIOSCIURUS.

Type.

Trouessart, Le Nat. ii. no. 37, p. 292 (1880) *H. gambianus* *.
Sciurus b, α, Major, P. Z. S. 1893, p. 189.

Skull square and strongly built. Anteorbital foramen well in front of the level of the cheek-teeth. Anterior ridge of zygoma-root strongly marked, stopping abruptly just at the maxillo-premaxillary suture.

Teeth $\frac{4}{4}$; the single premolar large, its anterior cusp very prominent and evidently taking on the function of p^3 . Molars of typical *Sciurus* structure, the lower ones clearly basin-shaped, without trace of transverse ridges.

Range. Ethiopian Region except South Africa.

List of species below.

3. MYRSILUS.

Type.

Genus novum..... *M. aubinnii*
 (*Macroxus aubinnii*, Gray).

External form normally Sciurine, but tail unusually long and slender.

Skull unusually shaped, very high, strongly convex in the naso-frontal region; maxillary masseteric fossa large, its upper ridge extending some way past the maxillo-premaxillary suture, as in *Protoxerus*; anteorbital foramen large, rounded, open, its hinder edge above p^4 , the part of the zygoma-root behind it reduced to a broad bar, an approach to this structure being shown by *Protoxerus*.

Cheek-teeth $\frac{5}{4}$.

Lower molars rather of the irregular basin-shaped structure found in *Protoxerus*, not transversely ridged.

Range. W. Africa; Liberia to Ashantee.

Myrsilus is a very peculiar form whose affinities I feel by

* *H. annulatus*, Trouessart et auct. al., but the evidence for the identification of Desmarest's non-localised *S. annulatus*, of which the type no longer exists, with the Gambian squirrel is so insufficient that I am not prepared to accept it.

no means sure about. Probably it is most akin to *Protoxerus*, in which Dr. Forsyth Major included it, but the shape of its skull is so very different that there can be no doubt it should be allowed generic rank.

4. FUNISCIURUS.

Type.

Trouessart, Le Nat. ii. no. 37, p. 293 (1880) *F. lemniscatus*.
Xerus, subg. *Paraxerus*, Major, t. c. p. 189 (in part.;
 not the type).

Skull elongate, smooth, rounded above, with a long muzzle; anterior ridge of zygoma-root falling far short of the maxillo-premaxillary suture; infraorbital foramen narrow, slit-like, in front of the level of p^3 .

Cheek-teeth $\frac{5}{4}$, hypsodont, rounded in section. P^3 proportionally well developed. P^4 without specially marked anterior cusp. Lower molars consisting of four well-marked transverse ridges, subequal in height, with well-defined (usually blackened) clefts between them; no individual cusps much surpassing the general level of the teeth. (See figures by de Winton, Ann. & Mag. N. H. (7) ii. p. 10, 1898.)

Range. West African Subregion only*.

This genus would seem to be the representative of *Paraxerus* in the West African Forest region. The teeth of *Funisciurus* are very highly specialized, far more so than in *Paraxerus*, and may be readily recognized by the characters above given.

5. PARAXERUS.

Type.

Xerus, subg. *Paraxerus*, Major, P. Z. S. 1893, p. 189 *P. cepapi*.

Skull somewhat elongate and rounded, but less so than in *Funisciurus*, the muzzle intermediate between that of the latter and normal squirrels. Anteorbital foramen and zygomatic ridge as in *Funisciurus*.

Cheek-teeth $\frac{5}{4}$. P^3 well developed; p^4 rounded in section, without prominent anterior cusp. Molars rather hypsodont, and with a tendency to the development of the transverse ridges found in *Funisciurus*, but less specialized than those of the latter. Lower molars similarly with four transverse

* Unless *Sciurus flavivittis*, Peters, proves to belong to this genus.

ridges, but these are irregular in development and shape, and are considerably surpassed in height by the lateral cusps, especially that at the antero-internal corner of each tooth.

Range. Ethiopian Region, most numerous in the east and south.

6. PROTOXERUS.

Xerus, subg. *Protoxerus*, Major, P. Z. S. 1893, p. 189 . . . Type.
P. stangeri.

Size very large. Skull heavily built, of normal shape; upper part of anterior zygoma-root bowed over as in the Spiny Squirrels (*Xerus*, &c.), its ridge carried forward beyond the maxillo-premaxillary suture; anteorbital foramen rounded, often very large.

Cheek-teeth $\frac{4}{4}$, in structure somewhat intermediate between those of *Xerus* and the true Squirrels. (*Cf.* figures by Major, *l. c.*)

Range. West African Forest region, eastwards into Uganda.

The six known forms of *Protoxerus* were worked out by me in 1906*, and considered all to be subspecies of *P. stangeri*.

7. EPIXERUS.

Genus novum..... Type.
E. wilsoni
(*Sciurus wilsoni*, du Ch.).

General characters as in *Protoxerus*, but the skull elongated, with a long muzzle, as in *Funisciurus*. Anteorbital foramen narrow, compressed, slit-like. Bullæ comparatively very small. Palate produced behind molars further than in any of the previous genera, more approaching the *Xerus* group.

Cheek-teeth $\frac{4}{4}$. Lower molars simple, basin-shaped, each with four well-marked cusps at the corners.

Range. West Africa.

The two Giant Squirrels that I refer to this genus, *E. wilsoni* and *ebii*, were transferred by de Winton from Major's *Protoxerus* to *Funisciurus*, a transference which I accepted in my paper on African Giant Squirrels, but I now think that, judging by the characters of the zygomatic ridge and molar structure, their resemblance to *Funisciurus* is merely accidental, and that they ought to constitute a group by themselves.

* Ann. Mag. N. H. (7) xviii. p. 295 (1906).

8. ATLANTOXERUS.

Xerus, subg. *Atlantoxerus*, Major, P. Z. S. 1893, p. 189. Type.
A. getulus.

Skull broad, low, and depressed; the forehead flat. Zygomata widely expanded.

Cheek-teeth $\frac{5}{4}$, p^3 well developed, standing in front of the middle of p^4 , which is much smaller than m^1 .

Molars brachyodont, at least as compared with those of *Geosciurus* and *Euxerus*, simple in structure.

Range. N. Africa, Morocco, &c.

9. XERUS.

Sciurus, subg. *Xerus*, Hempr. & Ehrenb. Symb. Phys. Type.
 i. text to pl. ix. (1832) *X. brachyotus*.

Skull much more bowed than in *Atlantoxerus*, its upper profile convex. Zygomata rather less expanded.

Cheek-teeth $\frac{4}{4}$, p^4 little smaller than m^1 .

Molars brachyodont, simple.

Range. N.E. Africa (Abyssinia, Somali, and E. Africa).

10. GEOSCIURUS.

Geosciurus, A. Smith, S. Afr. Quart. Journ. ii. p. 128 Type.
 (1834) *G. capensis* *.

Skull large, heavy, bowed, with very thick zygomata. Postorbital processes thick, short, directed backwards close to the hinder end of the orbito-temporal fossa.

Cheek-teeth $\frac{4}{4}$; p^4 large, rounded.

Molars very heavy, hypsodont, rounded.

Range. South Africa, western half.

11. EUXERUS.

Genus novum † Type.
E. erythropus
 (*Sciurus erythropus*, Geoff.).

Skull high, long, narrow; the zygomata very little expanded, in marked contrast to those of the other three genera

* Palmer (Index Mamm. p. 294) states that the type of *Geosciurus* is Geoffroy's *Sciurus erythropus*, but he must have been deceived by the somewhat unusual typography of Smith's paper. The S. African species is clearly the type.

† In Palmer's Index (p. 668) Rafinesque's genus *Tenotis* is stated to have "*Sciurus erythropus*" as its type, but I fear that the rules do not admit of this allocation. For, firstly, that species (which Rafinesque

of this group. Postorbital processes much reduced, directed backwards.

Cheek-teeth $\frac{5}{4}$; p^3 disproportionally small as compared with the large p^4 , which is of nearly the same size as the molars.

Molars highly hypsodont.

Range. West African Forest region, extending eastwards into British East Africa.

12. MYOSCIURUS.

Genus novum *M. minutus*
(*Sciurus minutus*, de Chaillu).

Size very small, the single species not larger than a house-mouse.

Skull as in the Oriental *Nannosciurus*, with the exception that the ectopterygoid is aborted and the tooth-row is a little further back, the lower edge of the zygoma-root coming opposite the premolar instead of the anterior or middle molar.

Cheek-teeth $\frac{4}{4}$ as against $\frac{5}{5}$ in *Nannosciurus*.

Molars smaller than in *Nannosciurus*, but similar in structure.

Range. West Africa (Gaboon).

The absence of p^3 , present in all the Asiatic *Nannosciuri*, and the suppression of the ectopterygoid, well-developed in the members of that genus, as in nearly all other squirrels, indicate that the African Pigmy Squirrel should be separated generically from its Asiatic allies.

The following is a list of the African Squirrels placed in their respective genera. The species are arranged alphabetically in each genus. Forms which have been described

had not seen, but was merely quoting from Geoffroy) was said to be "*perhaps* a species of my genus *Tenotis* . . ."; and the rule ('Science,' 1907, p. 521, says distinctly (*e. γ*) that a species which the author doubtfully refers to his genus cannot be taken as the type of it. Nor can *Tenotis* be taken as a monotypic genus (rule *c*), though "*T. griseus*" is the only species mentioned, for the genus is distinctly formed for "all the squirrels with pouches . . ."; so that all the pouched squirrels known in 1817 would have been included in it, and it would have been equally valid had the doubtfully included *T. griseus* not been mentioned.

Secondly, the definite quotation of *Tenotis* as a synonym of *Tamias* by Allen (Mon. N. Am. Rod. p. 779, 1877) appears to me in such a case to bear the authority of a "first reviser," and so to settle the question.

I fail to see any reason why Geoffroy's obvious misprint of "*erythropus*" should not be corrected into *erythropus*.

as subspecies are not included, unless there is a probability of their deserving specific rank :—

1. *Sciurus*, Linn.

lucifer, Thos.
poensis, A. Smith.
ruwenzorii, Schno.

2. *Heliosciurus*, Trouess.

abassensis, Neum.
bongensis, Heugl.
gambianus, Og. (= *annulatus*,
auct.)
isabellinus, Gr.
kaffensis, Neum.
keniæ, Neum.
multicolor, Rüpp.
mutabilis, Pet.
punctatus, Temm.
rufobrachiatus, Waterh.
undulatus, True.

3. *Myrsilus*, Thos.

aubinni, Gray.
salæ, Jent.

4. *Funisciurus*, Trouess.

akka, de Wint.
anerythrus, Thos.
auriculatus, Matsch.
carruthersi, Thos.
congius, Kuhl.
erythrogeus, Waterh.
isabella, Gray.
lemniscatus, Le C.
leucostigma, Temm.
mandingo, Thos.
mystax, de Wint.
pembertoni, Thos.
pyrrhopus, F. Cuv.
raptorum, Thos.
substriatus, de Wint.

5. *Paraxerus*, Maj.

alexandri, Thos. & Wr.
antonie, Thos. & Wr.
aruscensis, Pag.
boehmi, Reich.
cepapi, A. Smith.
emini, Stuhlmann.
gauana, Rhoads.
jacksoni, de Wint.
ochraceus, Huet.
pallidus, Pet.
pauli, Matsch.
sponsus, Thos. & Wr.
yulei, Thos.

6. *Protoxerus*, Maj.

stangeri, Waterh. (with five subspecies).

7. *Epixerus*, Thos.

ebii, Temm.
wilsoni, du Chaillu.

8. *Atlautoxerus*, Maj.

getulus, Linn.

9. *Xerus*, Hempr. & Ehr.

brachyotus, H. & E.
rutilus, Cretzschmann.

10. *Geosciurus*, A. Sm.

capensis, Kerr.

11. *Euxerus*, Thos.

erythropus, Geoff.
microdon, Thos.

12. *Myosciurus*, Thos.

minutus, du Chaillu.

Owing to want of skulls I am unable definitely to place :—

flavivittis, Peters, whose external appearance is that of *Funisciurus congius*, but whose geographical position and shape of skull (as figured by Peters) suggest *Paraxerus*.

bayonii, Bocage, probably related to *Sciurus poensis*, but *Funisciurus substriatus* has a similar indistinct lateral band, and perhaps a real relationship to it.